INSTRUCTION MANUAL

MODEL MSC-1(15)

MULTI-SYSTEM COMBINER

MOSELEY ASSOCIATES, INC.
SANTA BARBARA RESEARCH PARK
GOLETA, CALIFORNIA 93017

INSTRUCTION MANUAL

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MOSELEY ASSOCIATES, INC.
Santa Barbara Research Park
111 Castilian Drive
Goleta, California 93017

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January, 1973

INSTRUCTION MANUAL

MODEL MSC-1(15) MULTI-SYSTEM COMBINER

The Model MSC-1(15) Multi-System Combiner was designed to enable the operation of several items of Moseley Associates, Inc. remote control equipment over a single telephone line. The equipment involved would be the Model TRC-15AW Remote Control System, Model ADP-220 Automatic Data Printer, and Model SCS-2 Status System. The various signals are directed to their proper destinations by means of appropriate filters. Amplifiers and gain controls are included to enable various line losses to be accommodated. Connection to the telephone line is by means of an ordinary barrier strip, and the various Moseley Associates devices are connected with Type BNC connectors. Adjustment is straightforward and no unusual equipment is required for setup.

SPECIFICATIONS, MSC-1(15) (Each End)

Impedance presented to line	600Ω, ±10% balanced, floating, resistive.
Level applied to line	Adjustable up to 0 dBm, composite, maximum of three tones.
Adjustments	Individual tone send-level controls; group receive-level control.
Test Points	Front Panel: Ground, Send Level, Receive Level Internal: Send amplifier input and output Receive amplifier input and output
Operating temperature	0° to +140° Fahrenheit
Semiconductor complement	2 integrated circuit operational amplifiers, 1 transistor, 4 rectifiers, 2 regulators
Duty cycle	Continuous
Power requirements	120/240 VAC, 50/60 Hz, 20 watts
Required rack space	$3\frac{1}{2}$" vertical, $7\frac{1}{2}$" depth
Domestic shipping weight	15 pounds

SPECIFICATIONS, INTERCONNECTING LINE

Type of line	2-wire, half-duplex, voice-grade data line; 2-point.
Impedance	600Ω, ±10% balanced
Allowable line loss	16 dB at 1000 Hz, in addition to short-term variations of 3 dB maximum or long-term variations of 4 dB maximum, in addition to a maximum rolloff not to exceed 8 dB at 2700 Hz.
Allowable noise	Not greater in amplitude than 40 dB below received signal level for coherent tones; not greater in amplitude than 30 dB below received signal level for noncoherent noise.
Allowable distortion	Not more than 1% total harmonic distortion as measured at any frequency from 560 Hz to 2700 Hz.
Frequency translation error	Not more than 3 Hz
DC line continuity	Not required
Envelope delay distortion	No specification
Phase jitter	No specification

UNPACKING

The MSC-1(15) units should be carefully unpacked and inspected for any shipping damage. Confirm that the various components (inductors, connectors, semiconductors, etc.) are intact. Keep all packing material in case a claim is to be made against the carrier for damage. SHOULD THE DEVICE BE DAMAGED, IMMEDIATELY FILE A CLAIM WITH THE CARRIER. Confirm the electrical performance of the MSC-1(15) as soon as possible.

INSTALLATION

After physical inspection, the MSC-1(15) units should be mounted in a standard rack. Notice that the two ends (Studio Unit and Transmitter Unit) are not identical. Be sure that each unit is at the proper location. Since occasional adjustment (at the time of initial installation and at several month intervals) may be required, it is suggested that the units be mounted at an appropriate height. The rack should be well bonded to a good RF ground or a low-inductance earth ground. The various items may then be connected to the MSC-1(15) as shown in Drawing 92A1088.

All of the equipment should be connected at this time using appropriate coaxial cables and connectors. The primary purpose in doing this is to enable cable placement and routing to be established. The telephone line may be connected to the barrier strips at each end.

MODIFYING THE TRC-15

Each of the TRC-15 units must be configured in a specific manner for operation in conjunction with the MSC-1(15). Drawings 93A1053 and 93A1054 show the basic changes to the TRC-15A and are located at the rear of this manual. The Studio Unit of the TRC-15 requires two basic changes. Both of the changes affect the metering demodulator. Refer to drawing 93A1053. Not that it is necessary to assure that a jumper exists from pin 2 to pin 3 to accept an input through the BNC connector. Likewise, the metering tone bandpass filter is altered to increase its selectivity. This alteration consists of changing 9 capacitors. The new values for these capacitors are shown in 93A1053. Note that it is also necessary to have two jumper printed circuit modules installed in the Studio Unit. These jumpers replace the optional subcarrier demodulator and subcarrier generator. The jumpers complete the connections to the BNC connectors on the rear of the studio unit.

The alterations necessary to the Transmitter Unit of the TRC-15 are shown in drawing 93A1054. The change reflected in this drawing is the addition of a 47,000 ohm $\frac{1}{2}$ watt resistor in between pins 1 and 2.

This will enable the control bandpass filter to accept an input via the BNC connectors. As with the Studio Unit, it will be necessary to assure the two jumper printed circuit modules are installed. These jumpers replace the optional subcarrier generator and subcarrier demodulator.

ADJUSTMENT

The adjustment procedure given here is used for initial setup as well as annual (or however often deemed necessary) maintenance. The basic idea is that of using the various Send Level controls to adjust the amplitude of each tone to a level of -10 dBm when all other tones are removed from the system. When all tones are finally applied to the line, they will then add up to approximately 0 dBm, the signal level generally considered maximum for a private line. After the send levels are properly set, then the Receive Level controls are set for an output of 0 dBm per tone from the MSC-1(15). Under normal circumstances this will complete the initial or routine maintenance.

Bearing in mind the above-mentioned goals, proceed as follows at the studio location:

1. Connect an ordinary AC voltmeter to the Send Test Points. Set it to read AC voltages, and read the dB scale. Alternatively, a meter calibrated directly in dBm may be used.

2. Disconnect all cables from the Studio Unit except the telephone line and the logger interrogate signal.

3. With power applied to the MSC-1(15), adjust the Logger Send Level control for a reading of -10 dBm on the voltmeter while depressing the Interrogate button on the logger.

4. Do not readjust that control. Remove the logger cable.

5. Reconnect the Remote Control "Control" cable.

6. Adjust the Control Send Level control for a reading of -10 dBm on the voltmeter.

7. Do not readjust that control. Remove the TRC-15 remote control cable.

Before the studio Data Receive Gain control can be adjusted, the signals transmitted from the transmitter site must be adjusted properly. The following adjustments will be made at the transmitter site.

8. Remove all cables from the MSC-1(15) Transmitter Unit except the telephone line and the logger data output.

9. Connect the AC voltmeter or dB meter to the Send Level Test points.

10. With power applied to the MSC-1(15), adjust the Logger Send Level control for a reading of -10 dBm on the voltmeter.

11. Do not readjust that control. Remove the logger cable.

12. Reconnect the Remote Control metering cable.

13. Adjust the Metering Send Level control for a reading of -10 dBm on the voltmeter.

14. Do not readjust that control. Remove the Remote Control "Metering" cable.

15. Reconnect the Status System "Data" cable.

16. Adjust the Status Send Level control for a reading of -10 dBm on the voltmeter.

17. At the studio, reconnect the Logger Interrogate cable, and send a tone to the transmitter site by pressing the Interrogate button continuously.

18. At the transmitter site, connect the voltmeter between the Receive Test Point and Ground.

19. Adjust the Control Receive Gain control for a reading of 0 dBm.

At this point, the studio Send Levels and the transmitter Send Levels and Receive Gain Control are all adjusted. Remaining is the studio Receive Gain Control adjustment.

20. At the studio, connect the voltmeter between the Receive Test Point and Ground.

21. Adjust the Data Receive Gain control for a reading of 0 dBm.

22. At the transmitter, reconnect the Logger Data cable so that a tone is sent to the studio.

23. Reconnect all cables to all equipment.

Remember that the object of these adjustments is to have each tone impressed onto the telephone line at a level of -10 dBm at the sending end, and to have the receiving amplification set so that each tone is brought back up to 0 dBm prior to insertion into the individual equipment at the receiving end. The figure of -10 dBm is not arbitrary; it is arrived at from a study of the levels involved when three tones are impressed onto the telephone line simultaneously and the line is rated at a maximum of 0 dBm. When three tones are sent at once, each must be cut down to one-third of composite or total level. This means each tone must be cut down to -10 dBm for a composite or total peak level of 0 dBm.

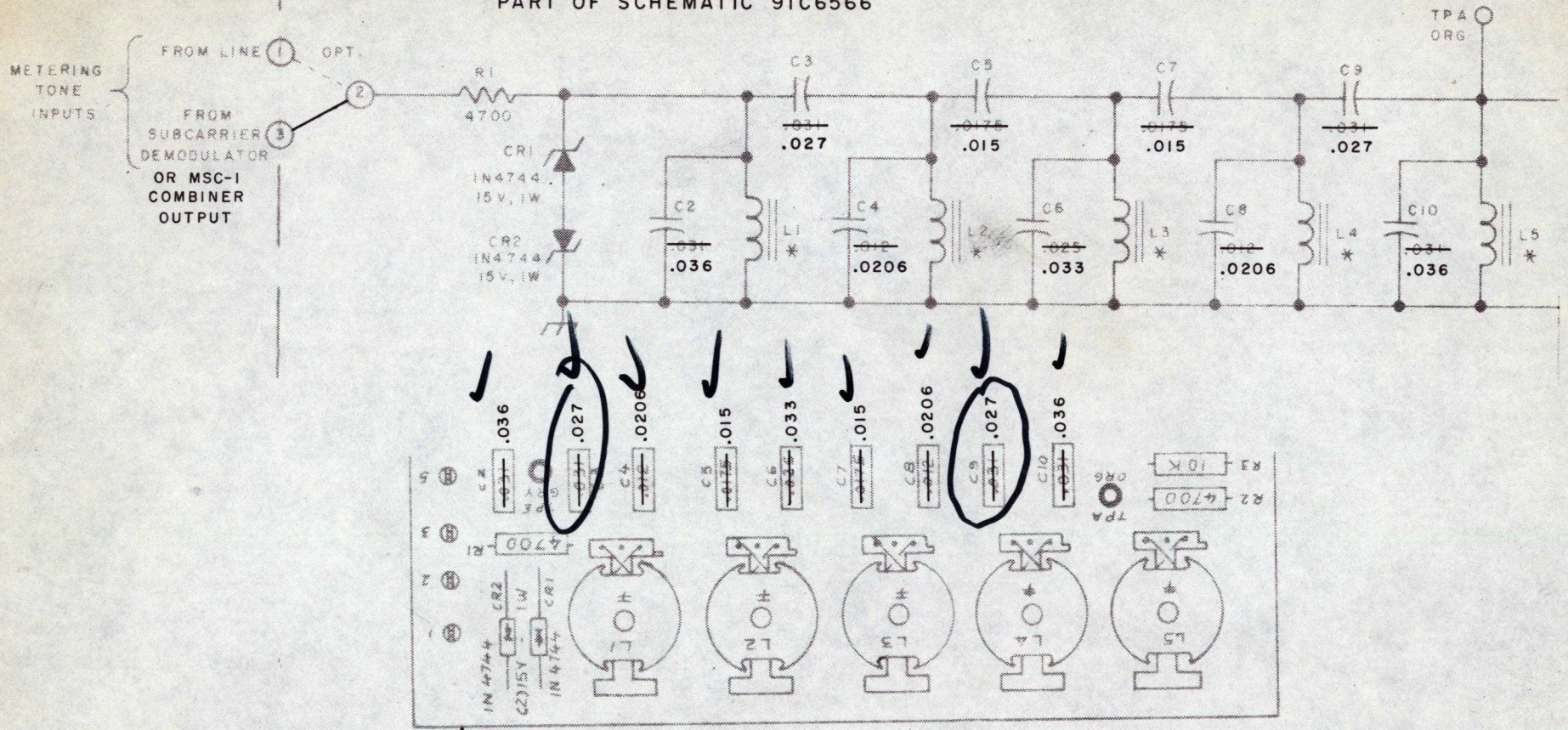
PRINCIPLES OF OPERATION

All signals originating at the studio and going to the transmitter site are in the frequency range of 300 Hz to 580 Hz. All signals originating at the transmitter site and returned to the studio are in the frequency range of 800 to 2700 Hz. Because of this, the various signals can be "steered" in a chosen direction with the aid of appropriate filters.

Refer now to Drawing 91C6502 which shows the studio end of the MSC-1(15). Signals from the associated equipment are applied to the connectors shown in the lower right-hand corner of the drawing. They pass through individual gain controls and then to a low-pass filter. This filter prevents any harmonics of these tones from being passed on to the following circuitry. The tones are amplified and applied to the telephone line. They cannot enter the receiving amplifier because of the action of the high-pass filter. However, signals from the telephone line (originating at the transmitter site, and in the range of 800 Hz to 2700 Hz) can easily go on to the receiving amplifier. Here they are amplified and sent on to the various studio equipment inputs.

The transmitter end of the MSC-1(15) operates in a similar manner. Refer to drawing 91C6503. Low-frequency control signals from the telephone line (originating at the studio) easily pass through the low-pass filter and on to the receiving amplifier. Then, they are routed to the inputs of the affiliated equipment. In a similar manner, the outputs of the transmitter equipment, in the 800 Hz to 2700 Hz range, are amplified to an appropriate level and applied to the telephone line. These high-frequency signals cannot get through the low-pass filter and so will not interfere with the signals (relatively weak) received from the studio.

PART OF SCHEMATIC 91C6566



PART OF COMPONENT LAYOUT 20A2341

TO REJECT 1600 Hz & ABOVE REMOVE CAPACITORS LINED OUT & REPLACE WITH VALUES SHOWN

REVISIONS	DATE	MGMT. APPR.

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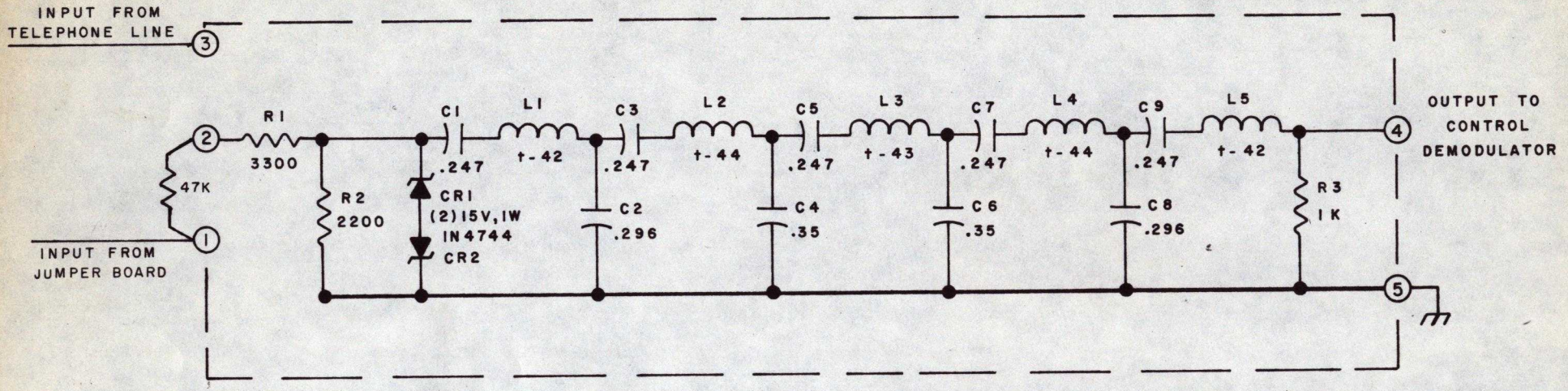
SANTA BARBARA RESEARCH PARK
GOLETA, CALIFORNIA 93017

BANDPASS FILTER MODIFICATION
TRC-15 AUDIBLE MTR. DEMOD.

TOL: FRACT. ± 1/32, .XX ± .030, .XXX ± .010, ∠ ± 1/2°

DWN	F X Y	5/18/73	SCALE:
CHK			93A1056
ENG			

805. 968
9621



NOTES:

1 UNLESS OTHERWISE SPECIFIED
RESISTOR VALUES ARE IN OHMS, 1/2W, 10%.
CAPACITOR VALUES ARE IN MICROFARADS.

2 † - DENOTES DWG 2C-1400

3 P.C. BOARD 51A5423

4 COMPONENT LAYOUT 20A2338

REMOTE TERM. (XMTR)

REVISIONS	DATE	MGMT. APPR.

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SCHEMATIC-TRC-15 CONTROL B.P.F.
WHEN USED WITH MSC-1

TOL: FRACT. ± 1/32, .XX ± .030, .XXX ± .010, ∠ ± 1/2°

DWN	[illegible]	9/19/72	SCALE: NONE
CHK			93A1054
ENG	JCP	27SEP72	

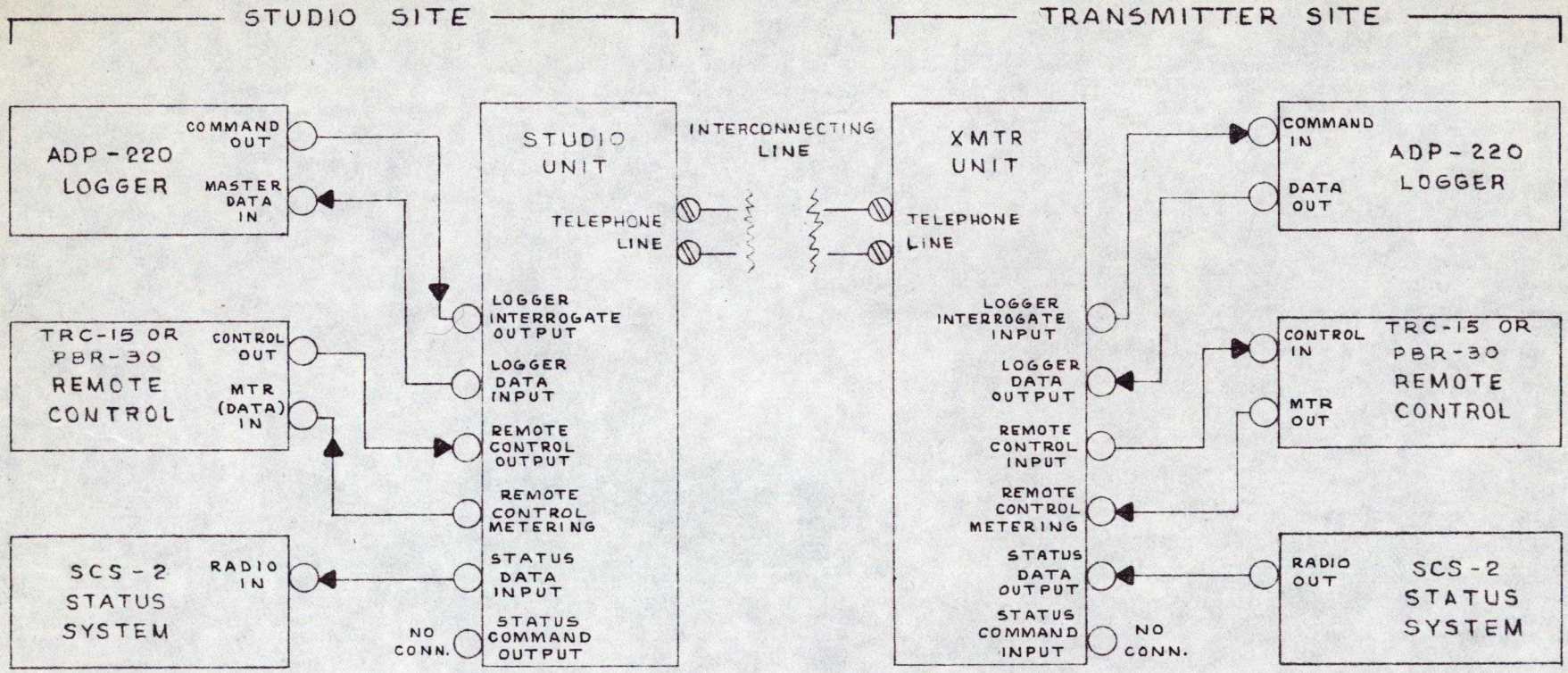

FIGURE 1

REVISIONS	DATE
B TRC-15 REPLACED PBR-15	1/26/73
A REVISE INPUT & OUTPUT LABELING	12/29/71

MGMT. APPR.

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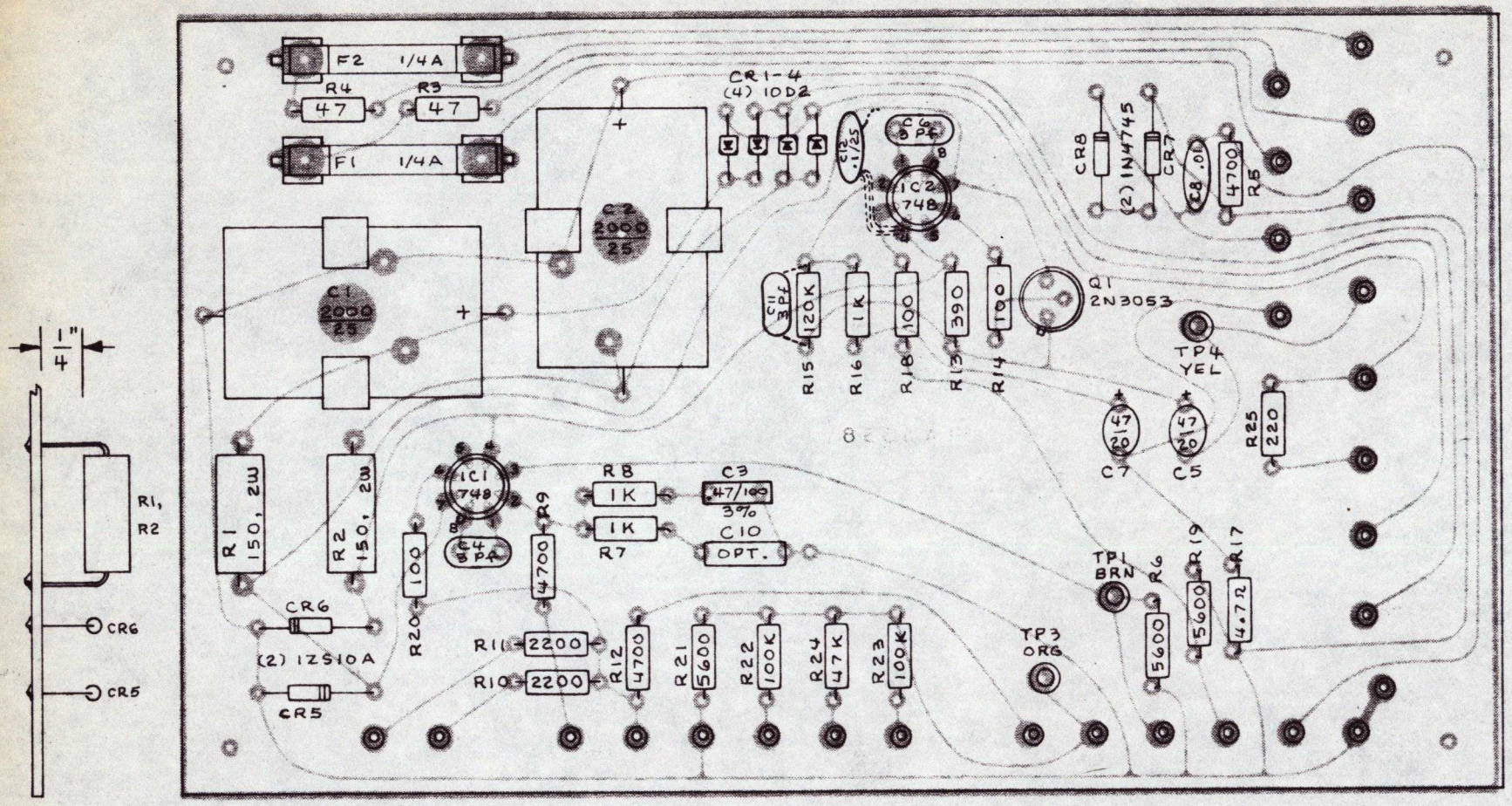
GOLETA, CALIFORNIA 93017

BLOCK DIAGRAM
MODEL MSC-1

TOL: FRACT. ± 1/32, .XX ± .030, .XXX ± .010, ∠ ± 1/2°

DWN	JAG	8-4-71	SCALE:
CHK			92A1088 B
ENG	JCT	25AUG71	



NOTES :

1. UNLESS OTHERWISE SPECIFIED
   RESISTOR VALUES ARE IN OHMS, 1/2 W, 10 %
   CAPACITOR " " " MICROFARADS
2. PC BOARD 51A5358
3. SCHEMATIC 91C6499

REVISIONS	DATE	MGMT. APPR.
D	P.C. BOARD WAS 51A5356. 10/26/72	
C	ADD SIDE VIEW FOR 1/4" SPACE. ECO 550 7/31/72	
B	ADD C11 & 12. R3 & 4 WERE 150Ω. R8 WAS 2200 ECO 475 10/13/71	
A	ADD R25. 9-7-71	

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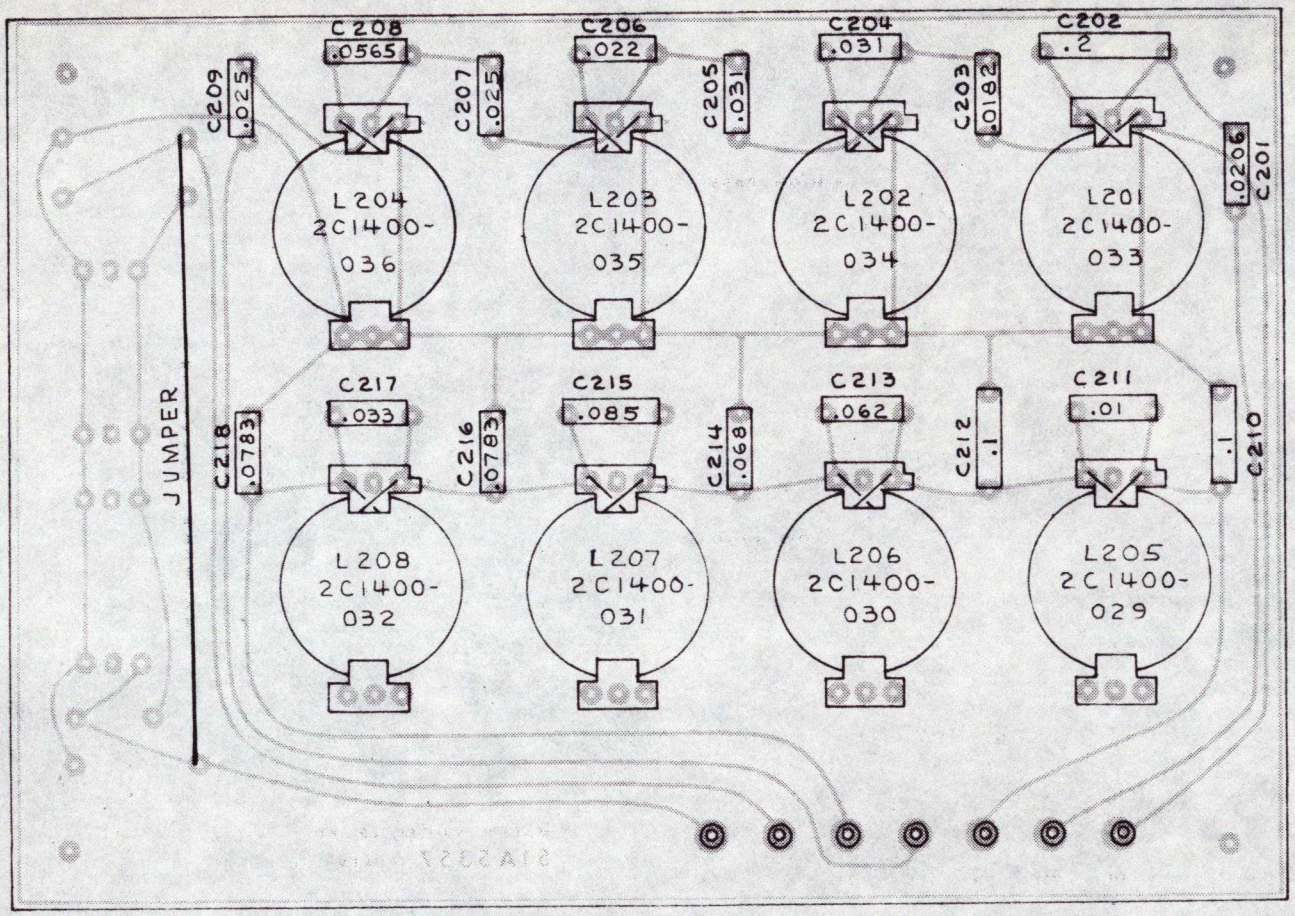
COMPONENT LAYOUT
MSC-1 STUDIO UNIT BD.

TOL: FRACT. ± 1/32, .XX ± .030, .XXX ± .010, ∠ ± 1/2°

DWN	JAG	8-23-71	SCALE: FULL
CHK			20A2280 D
ENG	JCT	24AUG71	



NOTES :

1 PC BOARD 51A5357

2 SCHEMATIC 91C6502.

3 CAPACITORS ARE METALIZED POLYCARBONATE ± 3% @ 100 V.

REVISIONS	DATE	MGMT. APPR.

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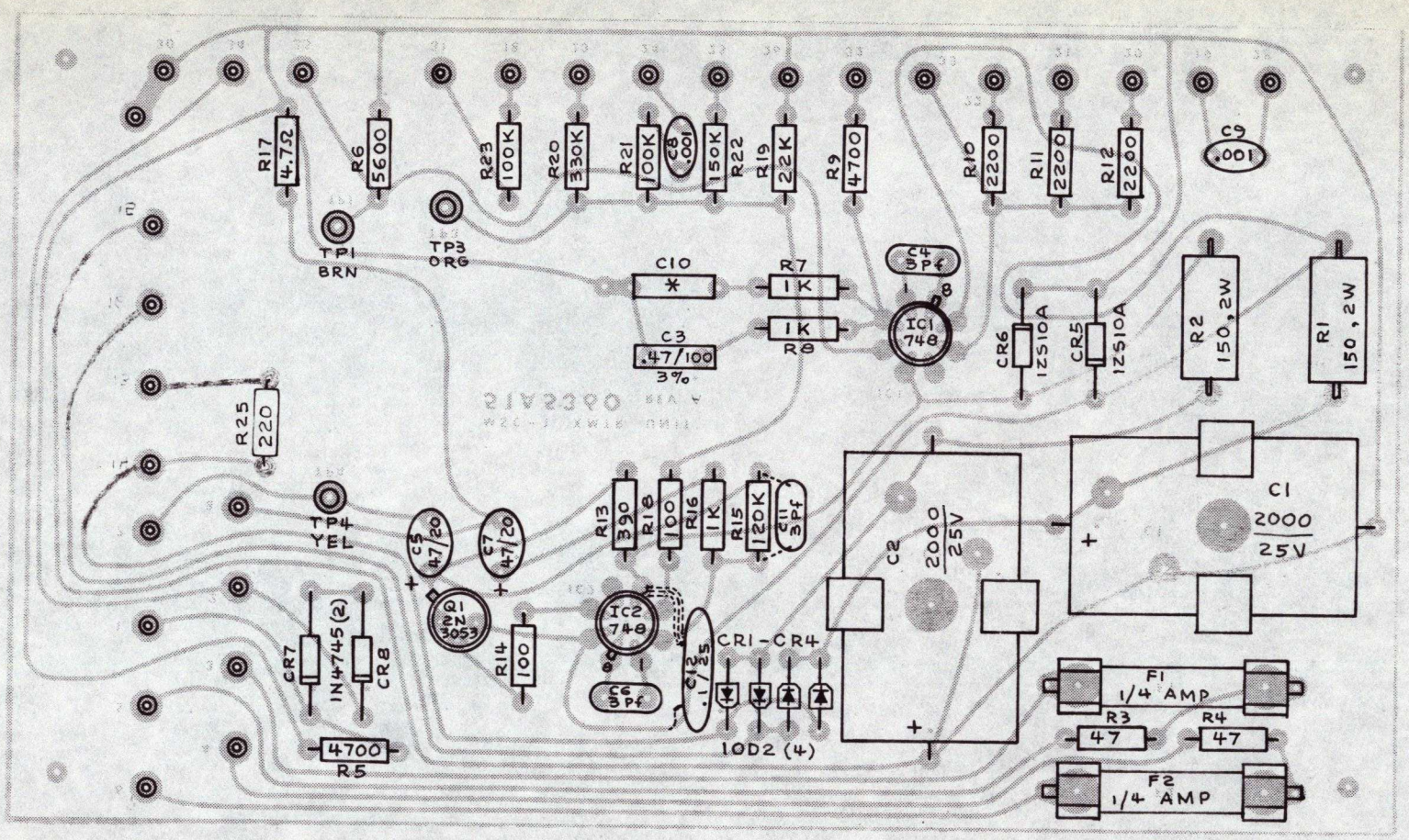
COMPONENT LAYOUT
MSC-1(15) S.U. FILTER BOARD

TOL: FRACT. ± 1/32, .XX ± .030, .XXX ± .010, ∠ ± 1/2°

DWN	JAG	8-23-71	SCALE: FULL
CHK			20A2292
ENG	JCK	23 OCT 71	



NOTES:

1. UNLESS OTHERWISE SPECIFIED
   RESISTOR VALUES ARE IN OHMS, 1/2W, 10%
   CAPACITOR VALUES ARE IN MICROFARADS.
2. * DENOTES OPTIONAL COMPONENT.
3. P.C. BOARD 51A5360.
4. SCHEMATIC 91C6500.

REVISIONS	DATE	MGMT. APPR.
C — R23 WAS 47K. R1 & R2 WERE 220. ADD SIDE VIEW. ECO 5550.	7/31/72	
B — ADD C11 & 12. R3 & 4 WERE 150Ω. R8 WAS 2200. ECO 4774	10/13/71	
A — ADD R25.	9-7-71	

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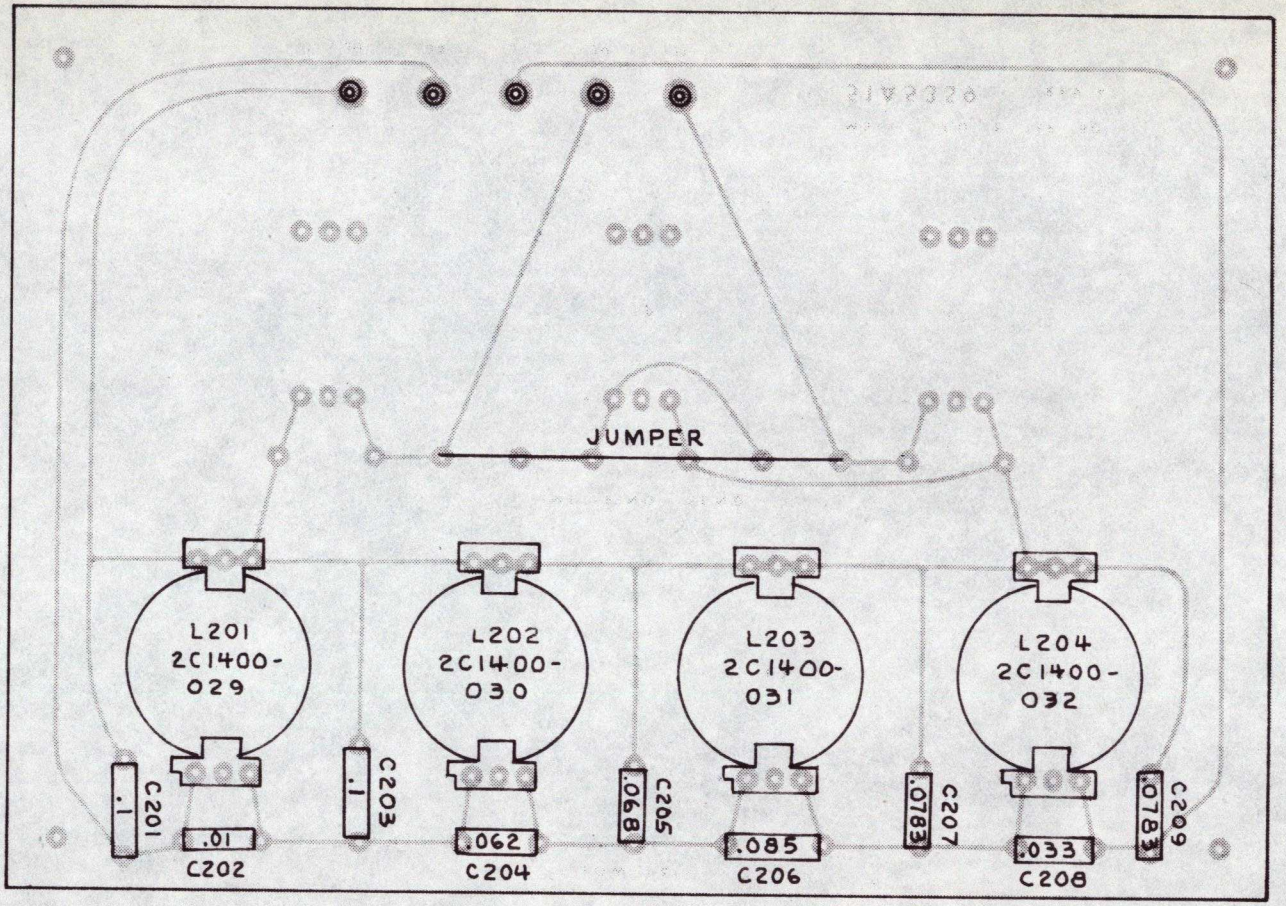
COMPONENT LAYOUT
XMTR UNIT BOARD MSC-1 TU

TOL: FRACT. ± 1/32, .XX ± .030, .XXX ± .010, ∠ ± 1/2°

DWN	F X Y	8/18/71	SCALE: FULL
CHK			20A2282 C
ENG	JCT	24AUG71	



NOTES:

1 P.C. BOARD S1A5359.

2 SCHEMATIC 91C6503.

3 CAPACITORS ARE METALIZED POLYCARBONATE, ±3% @ 100V.

REVISIONS	DATE	MGMT. APPR.

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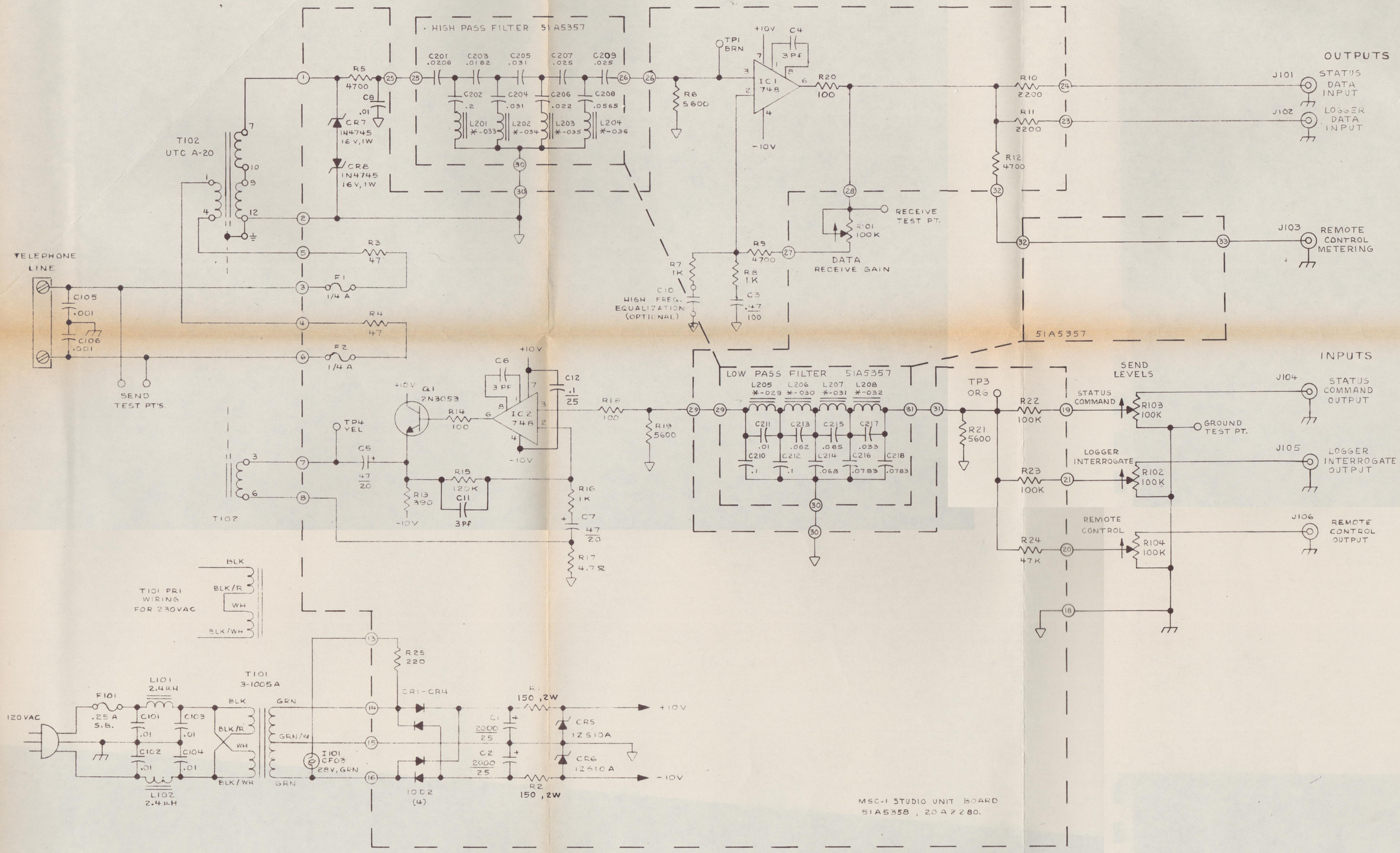
GOLETA, CALIFORNIA 93017

COMPONENT LAYOUT
T.U. FILTER BD. MSC-1 (15)

TOL: FRACT. ± 1/32, .XX ± .030, .XXX ± .010, ∠ ± 1/2°

DWN	F X Y	10/21/71	SCALE: FULL
CHK	[illegible]	10/21/71	20A2293
ENG	JCP	22 OCT 71	



NOTES:

1. UNLESS OTHERWISE SPECIFIED RESISTOR VALUES ARE IN OHMS 1/2 W, 10%. CAPACITOR VALUES ARE IN MICROFARADS.
2. P.C. BOARDS 51A5356 & 51A5357
3. COMPONENT LAYOUTS 20A2280 & 20A2292
4. ▽ DENOTES P.C. BD. COMMON.
5. ⏚ DENOTES CHASSIS GROUND.
6. * DENOTES 2C1400 CUP CORE COIL.

MSC-1 STUDIO UNIT BOARD
51A5358 , 20A2280.

REVISIONS	DATE	
A	4/23/73	R1 & R2 WERE 220. ECO 550

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

SCHEMATIC
STUDIO UNIT MODEL MSC-1 (15)

TOL. FRACT ± 1/32, XX ± .030, XXX ± .010

DWN	F X Y	8/17/71	SCALE:
CHK			91C6502 A
ENG	JCP	14 OCT 71	

LOW PASS FILTER 51A5359, 20A2293

L201 *-029 L202 *-030 L203 *-031 L204 *-032

C202 .01 C204 .062 C206 .085 C208 .033

C201 .1 C203 .1 C205 .068 C207 .0783 C209 .0783

R5 4700 R6 5600 R3 47 R4 47

CR7 IN4745 16V, 1W CR8 IN4745 16V, 1W

T102 UTC A-20

TP1 BRN

+10V C4 3PF IC1 748 -10V

R10 2200 R11 2200 R12 2200

OUTPUTS from NOVATO

J103 REMOTE CONTROL INPUT

J102 LOGGER INTERROGATE INPUT

J101 STATUS COMMAND INPUT

TELEPHONE LINE

C105 .001 C106 .001

F1 1/4 A F2 1/4 A

SEND TEST PT'S.

R7 1K C10 HIGH FREQ. EQUALIZATION (OPTIONAL) R8 1K C3 .47/100

R9 4700

R101 100K RECEIVE TEST PT. CONTROL RECEIVE GAIN

SEND LEVELS

INPUTS To NOVATO

LOGGER DATA R102 100K GROUND TEST PT.

J105 LOGGER DATA OUTPUT

STATUS DATA R103 100K

C9 .001 J104 STATUS DATA OUTPUT

REMOTE METERING R104 100K

R22 150K R21 100K C8 .001 R20 330K

R23 100K J106 REMOTE CONTROL METERING

51A5359, 20A2293

TP3 ORG

+10V Q1 2N3053 R14 100 C6 3PF IC2 748 -10V C12 .1/25

R18 100 R19 22K

TP4 VEL C5 47/20

R15 120K C11 3PF R13 390 -10V

R16 1K C7 47/20 R17 4.7Ω

T102

T101 PRI WIRING FOR 230VAC BLK BLK/R WH BLK/WH

R25 220 CR1-CR4 10D2 (4)

T101 3-1005A

F101 .25 A S.B. 120 VAC

L101 2.4 μH L102 2.4 μH

C101 .01 C102 .01 C103 .01 C104 .01

I101 CF03 28V, GRN

R1 150, 2W C1 2000/25 CR5 1ZS10A

C2 2000/25 CR6 1ZS10A R2 150, 2W

+10V -10V

MSC-1 XMTR UNIT BOARD
51A5360, 20A2282

NOTES:

1. UNLESS OTHERWISE SPECIFIED RESISTOR VALUES ARE IN OHMS 1/2 W, 10%. CAPACITOR VALUES ARE IN MICROFARADS.
2. P.C. BOARDS 51A5359 & 51A5360
3. COMPONENT LAYOUTS 20A2293 & 20A2282.
4. ▽ DENOTES P.C. BD. COMMON.
5. ⏚ DENOTES CHASSIS GROUND.
6. * DENOTES 2C1400 CUP CORE COIL.

REVISIONS	DATE
A RI &R2 WERE 220 R23 WAS 49K. ECO 550	4/24/73

MOSELEY ASSOCIATES, INC.
SANTA BARBARA, CALIFORNIA

SCHEMATIC
XMTR UNIT MODEL MSC-1 (15)

TOL. FRACT ± 1/32. XX ± .030. XXX ± .010

DWN	FXY	8/17/71	SCALE:
CHK			
ENG	JO	1400771	91C6503 A

LEFT

RIGHT

MAIN

STANDBY

LEFT

RIGHT

AUXILIARY

AM

FM

SPARE

FREQ. KHz

No. 1

No. 2

CALL:
FREQ. MHz

TO USE – CUT OUT AND REMOVE PROTECTIVE BACKING

MOSELEY ASSOCIATES, INC.

AUXILIARY SELF-STICK LABELS 10A1056